

Delos Living LLC

RF TEST REPORT

Report Type:

FCC Part 15.249 RF report

Model:

WA280

REPORT NUMBER:

230800860SHA-002

ISSUE DATE:

August 19, 2024

DOCUMENT CONTROL NUMBER:

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Manufacturer Site: SHENZHEN DINGXIN TECHNOLOGY CO., LTD
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Longhua District, Shenzhen, China

Product Name: Air purifier

Type/Model: WA280

FCC ID: 2BCO6-WA280

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2023): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2020): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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TEST REPORT

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Revision History

| Report No. | Version | Description | Issued Date |
|------------------|---------|-------------------------|-----------------|
| 230800860SHA-002 | Rev. 01 | Initial issue of report | August 19, 2024 |
| | | | |
| | | | |

Measurement result summary

| TEST ITEM | FCC REFERENCE | RESULT |
|--|------------------|--------|
| Equivalent Isotropic Radiated Power | 15.255(c) | Pass |
| Peak Conducted Output Power | 15.255(c) | Pass |
| Unwanted Emissions | 15.255(d)&15.209 | Pass |
| Power line conducted emission | 15.207(a) | Pass |
| Assigned bandwidth (20dB bandwidth) | 15.215(c) | Pass |
| Frequency Stability | 15.255(f) | Pass |
| Antenna requirement | 15.203 | Pass |

Notes: 1: NA =Not Applicable

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

| | |
|----------------------------|---|
| Product name: | Air purifier |
| Type/Model/PMN/HVIN: | WA280 |
| Description of EUT: | The EUT is Air purifier, it supports Thread and 60G Radar functions, there is only one model. we test them and list the worst results in this report. |
| Rating: | DC 12V, 15W Input: 120VAC, 60Hz 1.5A Output: Type-C 5.0V \approx 3.0A, 9.0V \approx 2.2A, 12.0V \approx 1.7A 20W max |
| EUT type: | <input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing |
| Software Version: | V1.0.5 |
| Hardware Version: | V1.2 |
| Sample Identification No.: | 0231226-05-001(for radiation sample), 0231226-05-002(for conduction sample) |
| Sample received date: | August 25, 2023 |
| Date of test: | August 25, 2023 ~ November 20, 2023 |

1.2 Technical Specification

| | |
|----------------------|---------------------|
| Frequency Range: | 57000MHz ~ 62000MHz |
| Type of Modulation: | FMCW |
| Channel Number: | 1 |
| Antenna Information: | Plate patch antenna |

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1.3 Description of Test Facility

| | |
|------------|--|
| Name: | Intertek Testing Services (Shanghai FTZ) Co., Ltd. |
| Address: | Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China |
| Telephone: | 86 21 61278200 |
| Telefax: | 86 21 54262353 |

| | |
|---|--|
| The test facility is recognized, certified, or accredited by these organizations: | CNAS Accreditation Lab Registration No. CNAS L21189 |
| | FCC Accredited Lab Designation Number: CN0175 |
| | IC Registration Lab CAB identifier.: CN0014 |
| | VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252 |
| | NVLAP Accreditation Lab NVLAP LAB CODE: 200849-0 |
| | A2LA Accreditation Lab Certificate Number: 3309.02 |

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2023)

ANSI C63.10 (2020)

KDB 364244 DO1 Meas 15.255 Radars V01

2.2 Mode of operation during the test

The channel was tested as representatives.

| Frequency Band (MHz) | | | | 57000 ~ 62000 | | | |
|----------------------|-----------------|---------|-----------------|---------------|-----------------|---------|-----------------|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 1 | 59150 | - | - | - | - | - | - |

2.3 Test software list

| Test Items | Software | Manufacturer | Version |
|--------------------|----------|--------------|---------|
| Conducted emission | ESxS-K1 | R&S | V2.1.0 |
| Radiated emission | ES-K1 | R&S | V1.71 |

2.4 Test peripherals list

| Item No. | Name | Band and Model | Description |
|----------|------|----------------|-------------|
| - | - | - | - |

2.5 Test environment condition:

| Test items | Temperature | Humidity |
|-------------------------------------|-------------|----------|
| Equivalent Isotropic Radiated Power | 22°C | 55% RH |
| Peak Conducted Output Power | | |
| Emission outside the frequency band | | |

| | | |
|--|------|--------|
| Occupied bandwidth | | |
| Radiated Emissions in restricted frequency bands | | |
| Power line conducted emission | 21°C | 52% RH |

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2.6 Instrument list

| Conducted Emission | | | | | |
|-------------------------------------|----------------------------|-------------------|------------------------|--------------|------------|
| Used | Equipment | Manufacturer | Type | Internal no. | Due date |
| <input checked="" type="checkbox"/> | Test Receiver | R&S | ESR7 | EC 6194 | 2024-02-08 |
| <input checked="" type="checkbox"/> | A.M.N. | R&S | ESH2-Z5 | EC 3119 | 2024-11-19 |
| <input type="checkbox"/> | A.M.N. | R&S | ENV4200 | EC 3558 | 2024-06-05 |
| <input checked="" type="checkbox"/> | Attenuator | Hua Xiang | Ts5-10db-6g | EC 6194-1 | 2023-12-07 |
| <input checked="" type="checkbox"/> | Shielded room | Zhongyu | - | EC 2838 | 2024-01-11 |
| Radiated Emission | | | | | |
| Used | Equipment | Manufacturer | Type | Internal no. | Due date |
| <input checked="" type="checkbox"/> | Test Receiver | R&S | ESIB 26 | EC 3045 | 2024-08-22 |
| <input checked="" type="checkbox"/> | Test Receiver | R&S | ESR | EC6501 | 2024-09-24 |
| <input checked="" type="checkbox"/> | PXA Signal Analyzer | Keysight | N9030A | EC 5338 | 2024-03-05 |
| <input checked="" type="checkbox"/> | Bilog Antenna | TESEQ | CBL 6112B | EC 6411 | 2024-09-12 |
| <input type="checkbox"/> | Pre-amplifier | R&S | AFS42-00101800-25-S-42 | EC 5262 | 2024-06-15 |
| <input checked="" type="checkbox"/> | Pre-amplifier | Tonscend | tap01018050 | EC 6432-1 | 2023-12-07 |
| <input checked="" type="checkbox"/> | Horn antenna | Tonscend | bha9120d | EC 6432-2 | 2024-02-15 |
| <input checked="" type="checkbox"/> | Horn antenna | ETS | 3116c | EC 5955 | 2024-06-16 |
| <input checked="" type="checkbox"/> | WW wave antenna (40-60G) | HengDa | M19RH | EC 6529-1 | 2024-03-09 |
| <input checked="" type="checkbox"/> | Mixer (40-60G) | VDi | | EC 6529-2 | 2024-03-05 |
| <input checked="" type="checkbox"/> | WW wave antenna (60-90G) | HengDa | M12RH | EC 6382-1 | 2024-03-14 |
| <input checked="" type="checkbox"/> | Mixer (60-90G) | VDi | | EC 6382-2 | 2024-03-05 |
| <input checked="" type="checkbox"/> | WW wave antenna (90-140G) | HengDa | M15RH | EC 6383-1 | 2024-03-05 |
| <input checked="" type="checkbox"/> | Mixer (90-140G) | VDi | | EC 6383-2 | 2024-03-05 |
| <input checked="" type="checkbox"/> | WW wave antenna (140-220G) | HengDa | M5RH | EC 6384 | 2024-03-27 |
| <input checked="" type="checkbox"/> | Mixer (140-220G) | Keysight | | EC 6384-1 | 2024-03-05 |
| <input checked="" type="checkbox"/> | Semi-anechoic chamber | Albatross project | - | EC 3048 | 2024-07-08 |
| Additional instrument | | | | | |
| Used | Equipment | Manufacturer | Type | Internal no. | Due date |
| <input checked="" type="checkbox"/> | Therom-Hygrograph | ZJ1-2A | S.M.I.F. | EC 3783 | 2024-03-24 |
| <input checked="" type="checkbox"/> | Pressure meter | YM3 | Shanghai Mengde | EC 3320 | 2024-08-16 |

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Test item | Measurement uncertainty |
|---|-------------------------|
| Maximum peak output power | $\pm 0.74\text{dB}$ |
| Radiated Emissions in restricted frequency bands below 1GHz | $\pm 4.90\text{dB}$ |
| Radiated Emissions in restricted frequency bands above 1GHz | $\pm 5.02\text{dB}$ |
| Emission outside the frequency band | $\pm 2.89\text{dB}$ |

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3 Equivalent Isotropic Radiated Power & Peak Conducted Output Power

Test result: Pass

3.1 Limit

Within the 57–71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power(EIRP):

(1) Products other than fixed field disturbance sensors and short-range devices for interactive motion sensing shall comply with one of the following emission limits, as measured during the transmit interval:

(i) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(ii) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51dBi.

(A) The provisions in this paragraph (c) for reducing transmit power based on antenna gain shall not require that the power levels be reduced below the limits specified in paragraph (c)(1)(i) of this section.

(B) The provisions of § 15.204(c)(2) and (4) that permit the use of different antennas of the same type and of equal or less directional gain do not apply to intentional radiator systems operating under this provision. In lieu thereof, intentional radiator systems shall be certified using the specific antenna(s) with which the system will be marketed and operated. Compliance testing shall be performed using the highest gain and the lowest gain antennas for which certification is sought and with the intentional radiator operated at its maximum available output power level. The responsible party, as defined in § 2.909 of this chapter, shall supply a list of acceptable antennas with the application for certification.

(2) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0–61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm. In addition, the average power of any emission outside of the 61.0–61.5 GHz band, measured during the transmit interval, but still within the 57–71GHz band, shall not exceed 10 dBm, and the peak power of any emission shall not exceed 13 dBm.

(3) For fixed field disturbance sensors other than those operating under the provisions of paragraph (c)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed –10 dBm and the peak EIRP level shall not exceed 10 dBm.

(4) The peak power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57–71 GHz band and has a video bandwidth of at least 10 MHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

3.2 Measurement Procedure

For Radiated emission above 1000MHz:

- a) The measurements were performed at 3m test site.
- b) The EUT is placed on a non-conductive table is 1.6 meter above test site ground plane.
- c) The measurement procedure described in ANSI C63.10-2013 Section 9.9 was followed, to find

maximum signal.

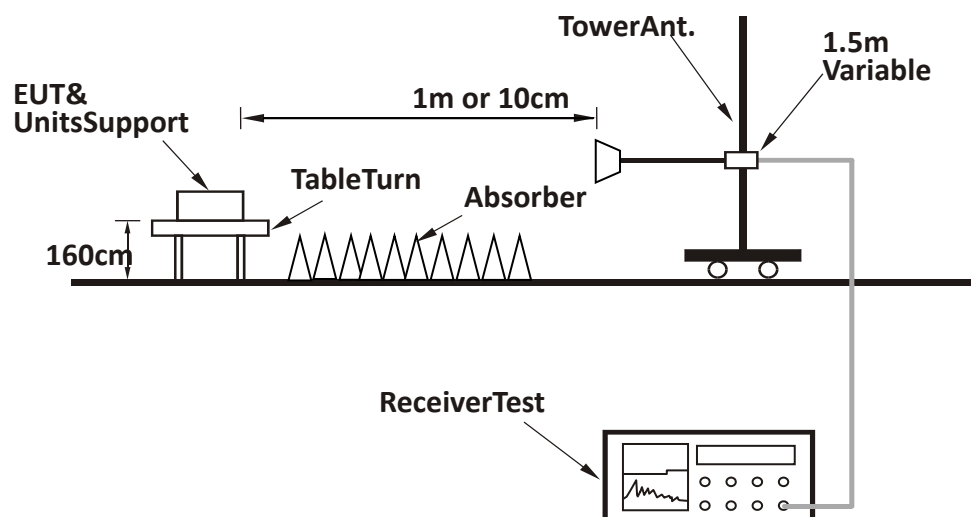
- d) The average and peak voltages was recorded from the DSO.
- e) Replace the EUT with mm-wave source to the RF input port of the instrumentation system.
- f) The mm-wave source is unmodulated.
- g) Adjust the amplitude of the mm-wave source such that the DSO indicates a voltage equal to the peak voltage recorded in step 4).
- h) Without changing any settings, replace the DSO with the mm-wave power meter.
- i) Measure and note the power.

Note:

1. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or $3 \times \text{RBW}$ (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported

3.3 Test Configuration

For Radiated emission above 40GHz:



3.4 Test Results of Radiated Emissions

Peak Power(e.i.r.p)

| Frequency (GHz) | P (dBm) | G (dBi) | E (dBμV/m) | d- Meas (m) | Desensitization factor (dB) | EIRP (dBm) | Limit (dBm) |
|--------------------|------------|------------|---------------|-------------------|-----------------------------------|---------------|----------------|
| 58.692 | -44.94 | 23.31 | 104.439 | 1 | 0.06 | -0.261 | 10.0 |

Note.

1. Sample calculation.

$$E = 126.8 - 20\log(\lambda) + P - G$$

where

E is the field strength of the emission at the measurement distance, in dBμV/m

P is the power measured at the output of the test antenna, in dBm

λ is the wavelength of the emission under investigation [300/fMHz], in m

G is the gain of the test antenna, in dBi

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7 + \text{Desensitization factor}$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m

d_{Meas} is the measurement distance, in m

$$\text{FMCW desensitization factor} = -20 * \log(\alpha) = 0.06\text{dB}$$

$$\alpha = \frac{1}{\sqrt[4]{1 + \left(\frac{2\ln(2)}{\pi}\right)^2 \left(\frac{F_s}{T_s B^2}\right)^2}}$$

$$F_s = \text{Sweep width} = 3688.6\text{MHz}$$

$$T_s = \text{Sweep time} = 96 \mu\text{s}$$

$$B = 3 \text{ dB IF bandwidth} = 10\text{MHz}$$

Peak Conducted Output Power:

| Frequency (GHz) | EIRP (dBm) | EUT Antenna Gain(dBi) | Conducted Output Power(dBm) | Limit (dBm) |
|--------------------|---------------|--------------------------|--------------------------------|----------------|
| 58.692 | -0.261 | 10 | -10.261 | -10.0 |

Note. Calculate the conducted output power (in watts) from the EIRP using Equation:

$$P_{cond} = EIRP_{Linear} / G_{EUT}$$

Where

P_{cond} is the conducted output power, in W

EIRP_{Linear} is the equivalent isotropically radiated power, in W

G_{EUT} is numeric gain of the EUT radiating element (antenna)

4 Unwanted emissions

Test result: Pass

4.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 |
| 1.705 ~ 30.0 | 30 | 30 |
| 30 ~ 88 | 100 | 3 |
| 88 ~ 216 | 150 | 3 |
| 216 ~ 960 | 200 | 3 |
| Above 960 | 500 | 3 |

4.2 Measurement Procedure

For Radiated emission below 30MHz:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz:

- The EUT was placed on the top of a rotating table 0.01 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360

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degrees to determine the position of the highest radiation.

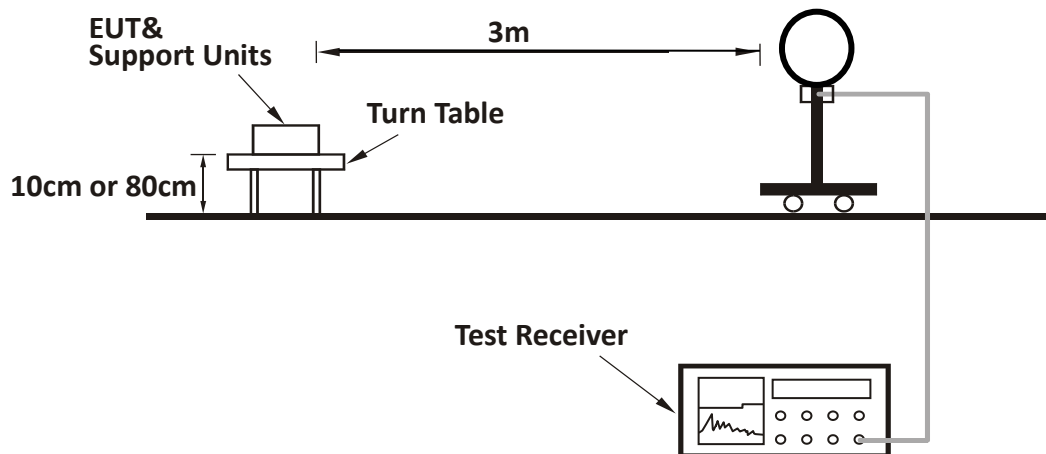
- k) The EUT was set 3 or 1 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- l) The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- m) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- n) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- o) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

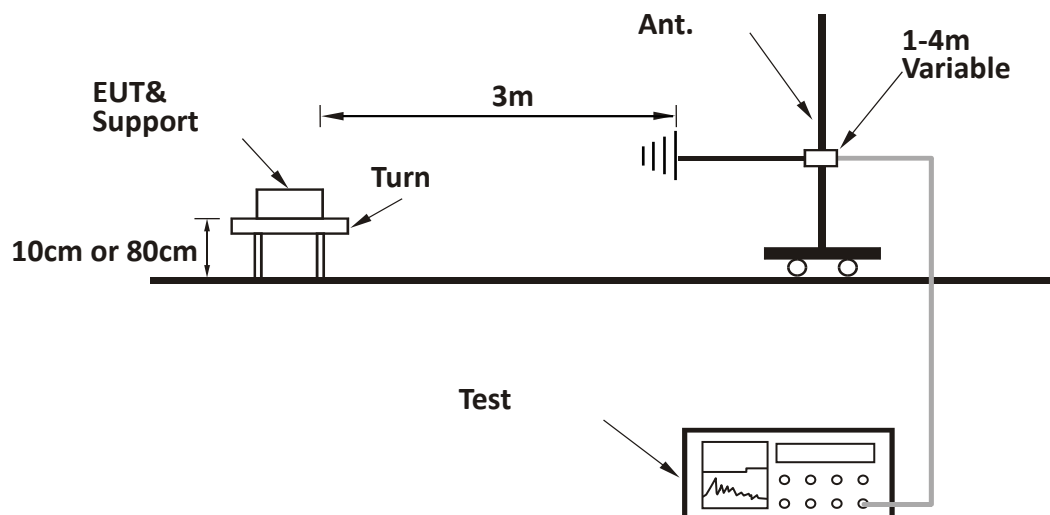
- 4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 5. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 6. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or $3 \times \text{RBW}$ (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
- 7. All modes of operation were investigated and the worst-case emissions are reported

4.3 Test Configuration

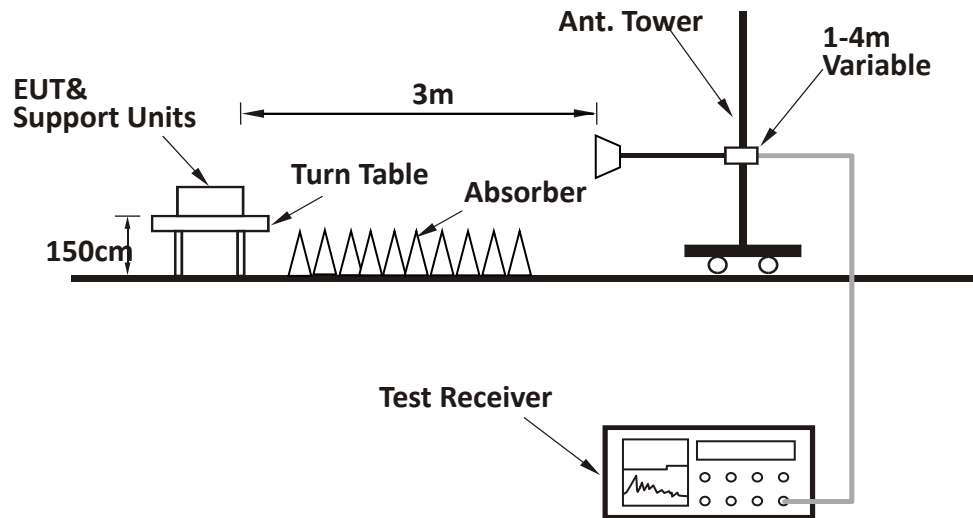
For Radiated emission below 30MHz:



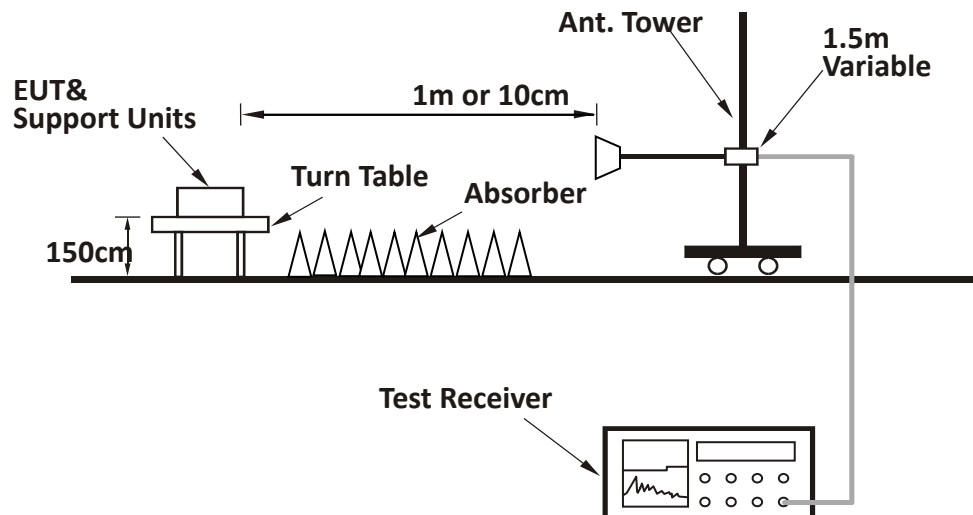
For Radiated emission 30MHz to 1GHz:



For Radiated emission 1GHz to 40GHz:



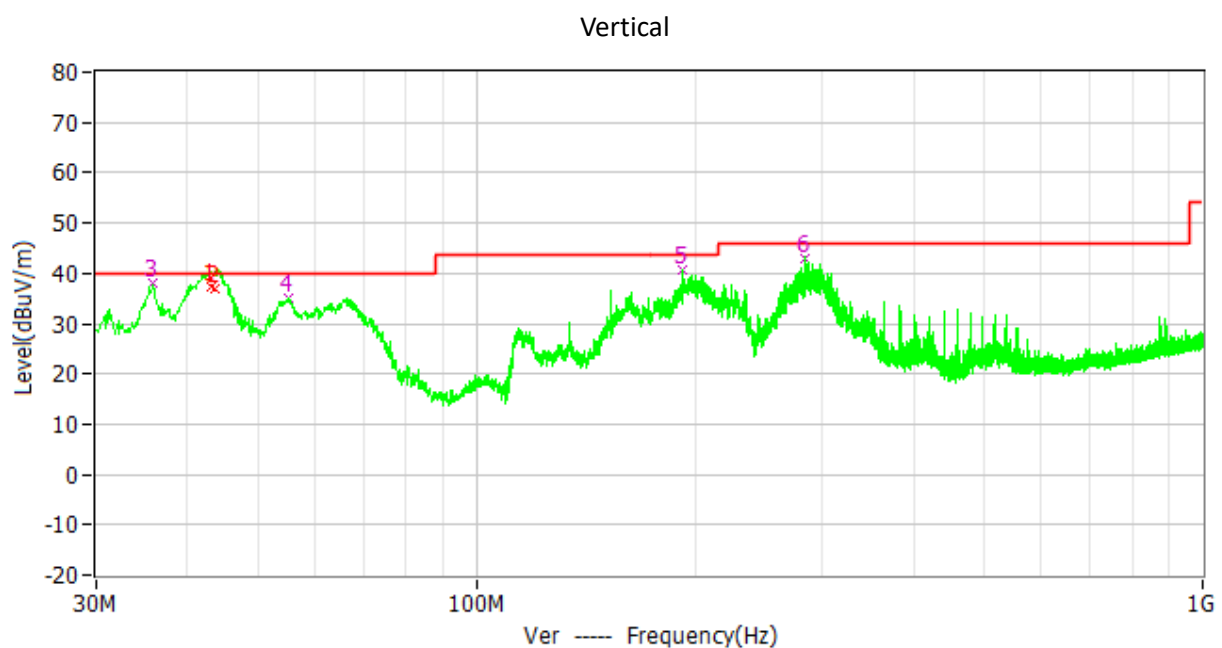
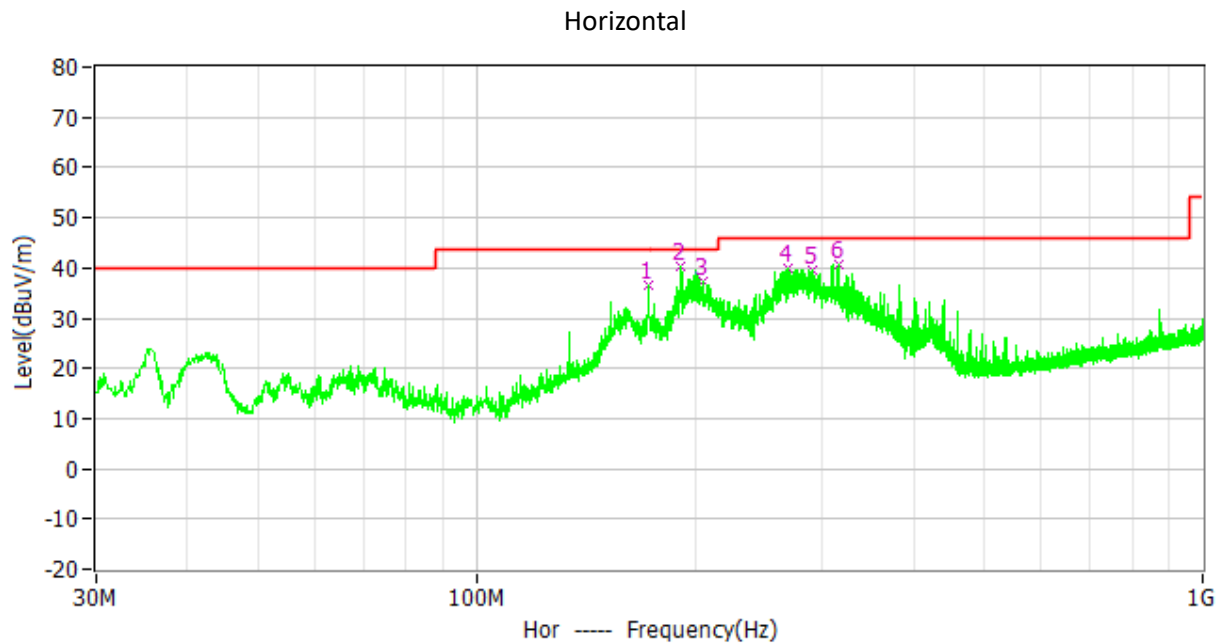
For Radiated emission above 40GHz:



4.4 Test Results of Radiated Emissions

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst waveform from 30MHz to 1000MHz is listed as below:



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Test data below 1GHz

| Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Correct Factor (dB/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---------|-----------------|----------------------------|-----------------------|----------------|-------------|----------|
| H | 172.590 | 36.4 | 13.6 | 43.5 | 7.1 | QP |
| H | 191.699 | 40.2 | 12.1 | 43.5 | 3.3 | QP |
| H | 205.182 | 37.2 | 11.5 | 43.5 | 6.3 | QP |
| H | 269.396 | 40.1 | 14.0 | 46.0 | 5.9 | QP |
| H | 290.542 | 39.7 | 14.8 | 46.0 | 6.3 | QP |
| H | 316.053 | 40.8 | 15.5 | 46.0 | 5.2 | QP |
| V | 43.131 | 37.4 | 14.0 | 40.0 | 2.6 | QP |
| V | 43.701 | 37.1 | 14.1 | 40.0 | 2.9 | QP |
| V | 35.917 | 37.9 | 13.1 | 40.0 | 2.1 | QP |
| V | 55.026 | 35.2 | 14.1 | 40.0 | 4.8 | QP |
| V | 191.796 | 40.6 | 12.1 | 43.5 | 2.9 | QP |
| V | 283.655 | 43.1 | 14.5 | 46.0 | 2.9 | QP |

The emission was conducted from 1GHz to 40GHz

| Antenna | Frequency (MHz) | Corrected Reading (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
|---------|-----------------|----------------------------|----------------|-------------|----------|
| H | 8563 | 41.60 | 74.00 | 32.40 | PK |
| H | 8563 | 30.20 | 54.00 | 23.80 | AV |
| H | 17966 | 41.50 | 74.00 | 32.50 | PK |
| H | 17966 | 30.00 | 54.00 | 24.00 | AV |
| H | 25522 | 53.61 | 74.00 | 20.39 | PK |
| H | 25522 | 45.38 | 54.00 | 8.62 | AV |
| H | 38325 | 51.49 | 74.00 | 22.51 | PK |
| H | 38325 | 42.89 | 54.00 | 11.11 | AV |
| V | 7677 | 41.90 | 74.00 | 32.10 | PK |
| V | 7677 | 28.80 | 54.00 | 25.20 | AV |
| V | 17898 | 41.80 | 74.00 | 32.20 | PK |
| V | 17898 | 30.20 | 54.00 | 23.80 | AV |
| V | 23796 | 53.80 | 74.00 | 20.20 | PK |
| V | 23796 | 44.55 | 54.00 | 9.450 | AV |
| V | 39763 | 52.45 | 74.00 | 21.55 | PK |
| V | 39763 | 43.09 | 54.00 | 10.91 | AV |

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Remark: 1. Correct Factor = Antenna Factor + Cable Loss (- Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

The emission was conducted from 40GHz to 200GHz

| Antenna | Frequency (GHz) | P (dBm) | G (dBi) | E (dBμV/m) | d-Meas (m) | EIRP (dBm) | PD (pW/cm ²) | Limit (pW/cm ²) |
|---------|-----------------|---------|---------|------------|------------|------------|--------------------------|-----------------------------|
| H | 40265 | -63.67 | 22.76 | 82.926 | 1 | -21.774 | 5.8824 | 90 |
| H | 71222 | -59.09 | 23.58 | 91.640 | 1 | -13.060 | 43.7451 | 90 |
| H | 122615 | -67.31 | 22.91 | 88.808 | 1 | -15.892 | 22.7923 | 90 |
| H | 193768 | -56.21 | 22.85 | 103.943 | 0.1 | -20.757 | 7.4347 | 90 |
| V | 40060 | -63.86 | 22.76 | 82.692 | 1 | -22.008 | 5.5734 | 90 |
| V | 71416 | -63.08 | 23.58 | 87.673 | 1 | -17.027 | 17.5506 | 90 |
| V | 122570 | -67.47 | 22.91 | 88.645 | 1 | -16.055 | 21.9517 | 90 |
| V | 193640 | -56.98 | 22.85 | 103.167 | 0.1 | -21.533 | 6.2186 | 90 |

Remark: 1. Correct Factor = Antenna Factor + Cable Loss + Mixer Conversion Loss, the value was added to Original Receiver Reading by the software automatically.
2. Sample calculation.

$$E = 126.8 - 20\log(\lambda) + P - G$$
where
E is the field strength of the emission at the measurement distance, in dBμV/m
P is the power measured at the output of the test antenna, in dBm
λ is the wavelength of the emission under investigation [300/fMHz], in m
G is the gain of the test antenna, in dBi

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$
where
EIRP is the equivalent isotropically radiated power, in dBm
 E_{Meas} is the field strength of the emission at the measurement distance, in dBμV/m
 d_{Meas} is the measurement distance, in m

$$PD = EIRP_{Linear} / 4\pi d^2 = 10^{(EIRP/10)} \cdot 10^9 / (4 \cdot 3.14 \cdot 300 \cdot 300) = 10^{(EIRP/10)} \cdot 885$$
where
PD is the power density at the distance specified by the limit, in pW/cm²
 $EIRP_{Linear}$ is the equivalent isotropically radiated power, in pW
d is the 300cm

5 Frequency stability

Test result: Pass

5.1 Limit

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range -20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

5.2 Test Result

| VOLTAGE (%) | POWER (V AC) | TEMP (°C) | Tested Frequency: 59.15 GHz | |
|-------------|--------------|-----------|-----------------------------------|------------------------------------|
| | | | Measured low frequency (FL) (GHz) | Measured High frequency (FH) (GHz) |
| 100% | 120 | -20 | 57.280 | 61.010 |
| 100% | | -10 | 57.286 | 61.016 |
| 100% | | 0 | 57.284 | 61.011 |
| 100% | | +10 | 57.275 | 61.013 |
| 100% | | +20 | 57.272 | 61.011 |
| 100% | | +30 | 57.276 | 61.015 |
| 100% | | +40 | 57.273 | 61.014 |
| 100% | | +50 | 57.282 | 61.012 |
| 115% | 138 | +20 | 57.271 | 61.012 |
| 85% | 102 | +20 | 57.272 | 61.011 |

Note: Fundamental emissions were contained within the frequency bands

6 Power line conducted emission

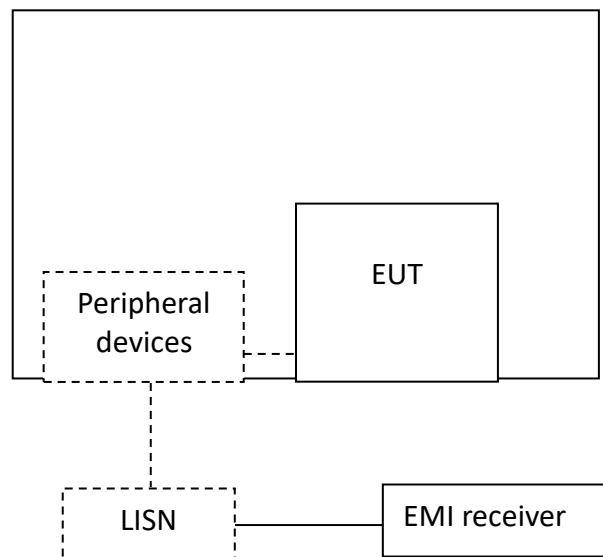
Test result: Pass

6.1 Limit

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|-----------------------------|------------------------|------------|
| | QP | AV |
| 0.15-0.5 | 66 to 56* | 56 to 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

6.2 Test Configuration



TEST REPORT**6.3 Measurement Procedure**

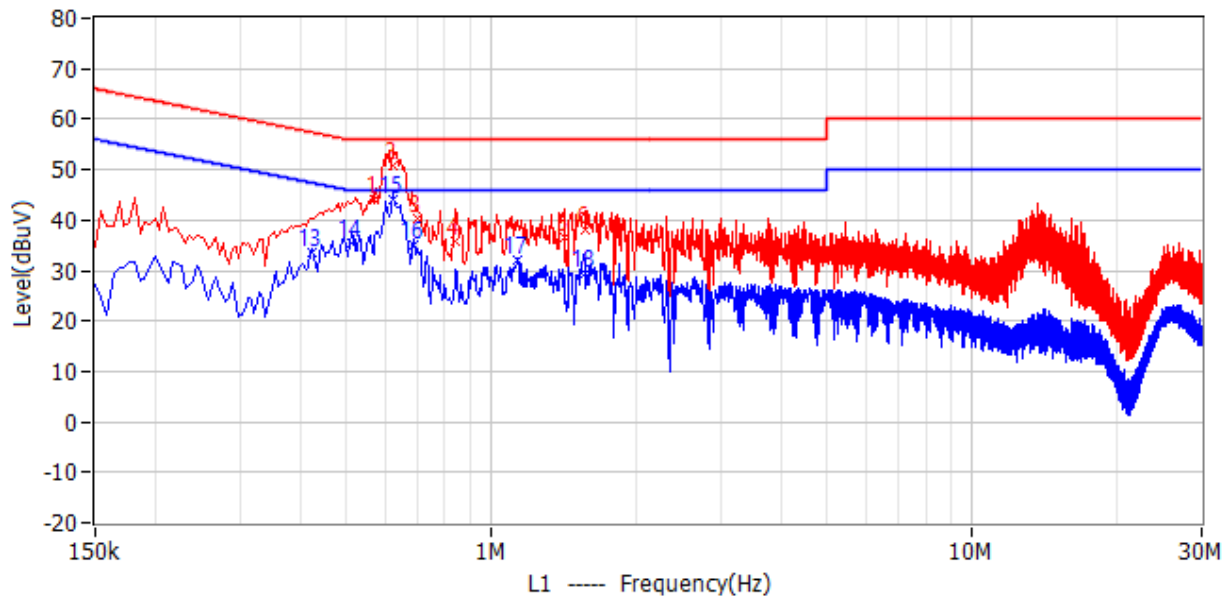
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

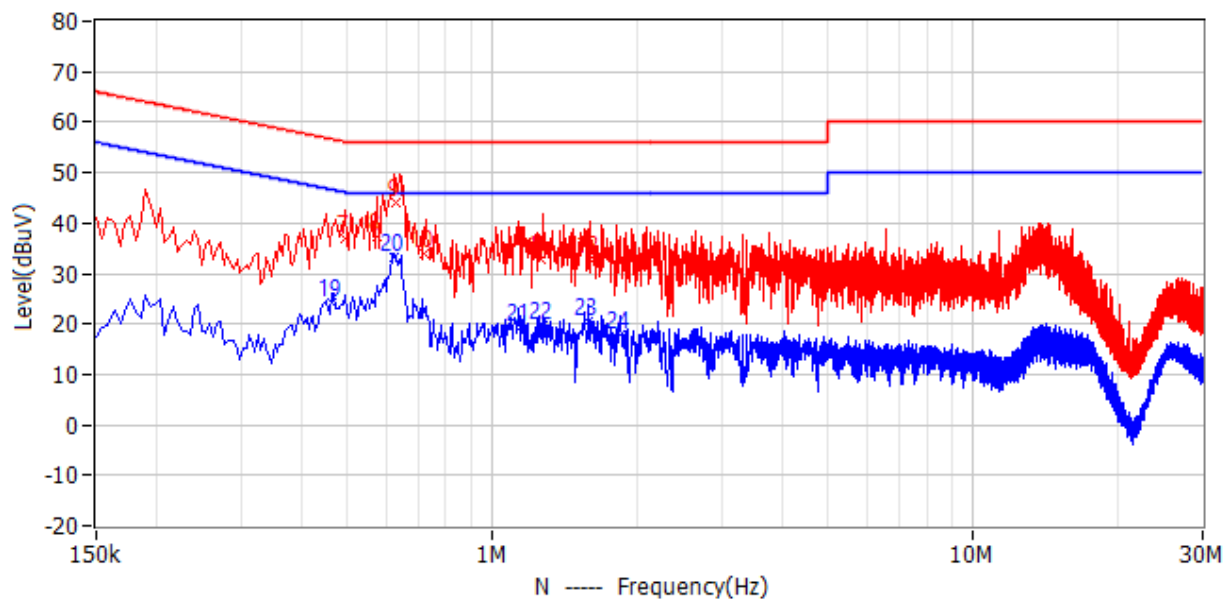
The bandwidth of the test receiver is set at 9 kHz.

6.4 Test Results of Power line conducted emission

L line



N line



TEST REPORT

Test Data:

| No. | Frequency | Limit dBuV | Level dBuV | Margin dB | Reading dBuV | Factor dB | Detector | Phase |
|-----|------------|---------------|---------------|--------------|-----------------|--------------|----------|-------|
| 1 | 573.000kHz | 56.0 | 44.2 | 11.8 | 37.9 | 6.3 | QP | L1 |
| 2 | 622.500kHz | 56.0 | 50.8 | 5.2 | 44.5 | 6.3 | QP | L1 |
| 3 | 699.000kHz | 56.0 | 40.4 | 15.6 | 34.1 | 6.3 | QP | L1 |
| 4 | 843.000kHz | 56.0 | 35.7 | 20.3 | 29.4 | 6.3 | QP | L1 |
| 5 | 1.415MHz | 56.0 | 36.5 | 19.5 | 30.2 | 6.3 | QP | L1 |
| 6 | 1.572MHz | 56.0 | 38.1 | 17.9 | 31.8 | 6.3 | QP | L1 |
| 7 | 492.000kHz | 56.1 | 36.9 | 19.2 | 30.7 | 6.2 | QP | N |
| 8 | 577.500kHz | 56.0 | 37.4 | 18.6 | 31.2 | 6.2 | QP | N |
| 9 | 631.500kHz | 56.0 | 44.1 | 11.9 | 37.9 | 6.2 | QP | N |
| 10 | 721.500kHz | 56.0 | 33.9 | 22.1 | 27.6 | 6.3 | QP | N |
| 11 | 1.262MHz | 56.0 | 32.9 | 23.1 | 26.6 | 6.3 | QP | N |
| 12 | 1.604MHz | 56.0 | 32.7 | 23.3 | 26.4 | 6.3 | QP | N |
| 13 | 424.500kHz | 47.4 | 33.5 | 13.8 | 27.2 | 6.3 | AV | L1 |
| 14 | 510.000kHz | 46.0 | 35.6 | 10.4 | 29.4 | 6.2 | AV | L1 |
| 15 | 627.000kHz | 46.0 | 44.2 | 1.8 | 37.9 | 6.3 | AV | L1 |
| 16 | 690.000kHz | 46.0 | 35.1 | 10.9 | 28.8 | 6.3 | AV | L1 |
| 17 | 1.136MHz | 46.0 | 31.9 | 14.1 | 25.5 | 6.4 | AV | L1 |
| 18 | 1.572MHz | 46.0 | 29.5 | 16.5 | 23.2 | 6.3 | AV | L1 |
| 19 | 465.000kHz | 46.6 | 24.3 | 22.3 | 18.1 | 6.2 | AV | N |
| 20 | 622.500kHz | 46.0 | 33.1 | 12.9 | 26.9 | 6.2 | AV | N |
| 21 | 1.145MHz | 46.0 | 19.2 | 26.8 | 12.9 | 6.3 | AV | N |
| 22 | 1.271MHz | 46.0 | 19.6 | 26.4 | 13.3 | 6.3 | AV | N |
| 23 | 1.581MHz | 46.0 | 20.3 | 25.7 | 14.0 | 6.3 | AV | N |
| 24 | 1.851MHz | 46.0 | 18.0 | 28.0 | 11.7 | 6.3 | AV | N |

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Level = Reading + Factor

3. Margin = Limit - Level

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

7 Assigned bandwidth (20dB bandwidth)

Test result: Pass

7.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission is contained within the allocated frequency band.

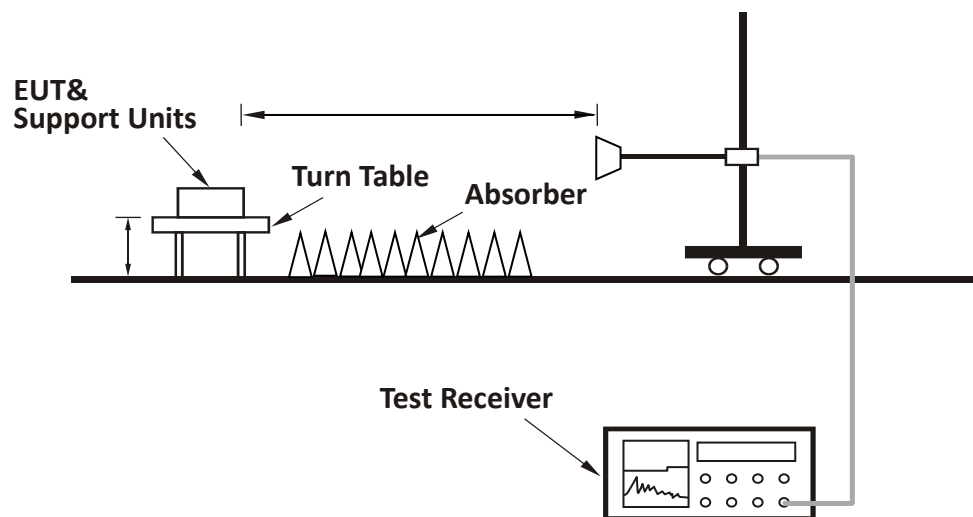
7.2 Measurement Procedure

The 20dB Bandwidth is measured using the Spectrum Analyzer.

Set Span = 2 to 3 times the 20 dB bandwidth, RBW = approximately 1% to 5% of the actual occupied, VBW > 3xRBW, Sweep = auto, Detector = peak, Trace = max hold.

The test was performed at one channel.

7.3 Test Configuration



7.4 The results

| Frequency band (MHz) | 20dB Bandwidth (MHz) | 99% Bandwidth (MHz) | F _L at 20dB BW (MHz) | F _H at 20dB BW (MHz) |
|----------------------|----------------------|---------------------|---------------------------------|---------------------------------|
| 57000 ~ 71000 | 57272.60 | 57289.07 | >57000 | / |
| | 61013.42 | 60977.64 | / | <71000 |
| Limit | N/A | N/A | F _L >57000 | F _H <71000 |
| Result | Complied | | | |



8 Antenna requirement

Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Result:

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

***** END *****